



Joint Research Centre

*The European Commission's
in-house science service*

Annual Report 2011

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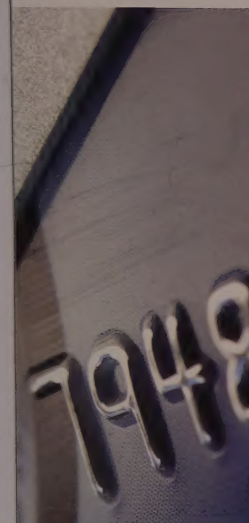
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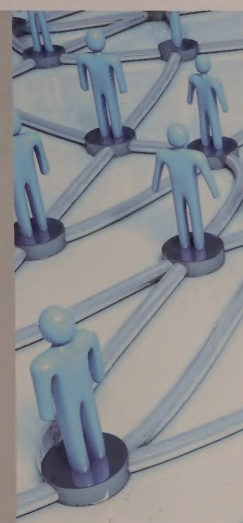
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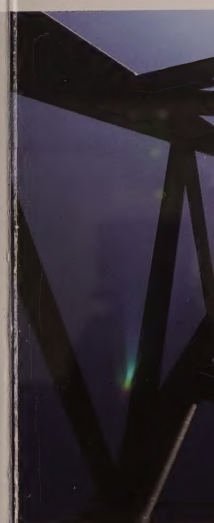
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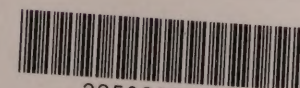
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"Scientific Support to a Competitive European Low Carbon Economy: Energy, Transport and Emerging Technologies"

Conference under Polish EU presidency co-organised with the Ministry of Science and Higher Education of Poland and the Polish Academy of Sciences, Warsaw 7 July 2011.



"Building a Transatlantic Scientific Bridge"

Seminar co-hosted with Ambassador of the United States to the European Union, Brussels 21 November 2011.

"Towards an Open and Competitive Economy: Examining the Roots of Innovation"

Conference under Hungarian EU presidency co-organised with the Hungarian Ministry for National Economy and the National Innovation Office, Budapest 5 April 2011.



"Future of global food and farming. How can science support food security?"

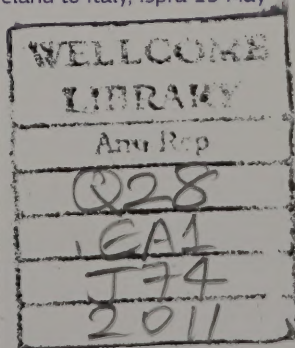
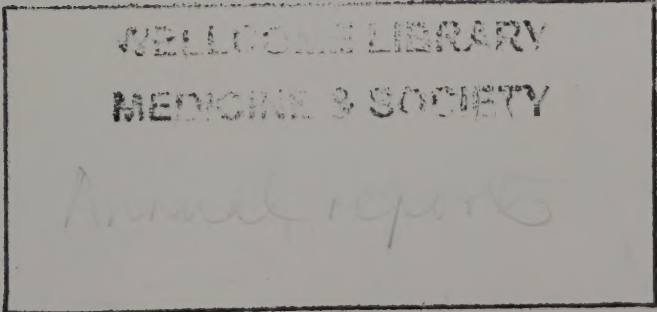
Seminar co-hosted with UK Government Office for Science, Brussels 30 March 2011.



The JRC and the Brazilian Ministry of Science, Technology and Innovation (MCTI) signed a Letter of Intent to strengthen cooperation, Brussels 4 October 2011.



Visit of His Excellency, Patrick Hennessey, Ambassador of Ireland to Italy, Ispra 19 May 2011.



Foreword by Máire Geoghegan-Quinn

European Commissioner for Research, Innovation and Science

The Innovation Union strategy and the €80 billion Horizon 2020 proposal, are all about getting good ideas to the market and bridging the gap between discovery and delivery. They send out a clear message: to speed up economic recovery and to get back on the path of growth and jobs, we must step up investment in research. Of course, to make this investment work, we need EU-wide policies that are based on the best possible scientific advice available. This is where the expertise of the European Commission's in-house science service, the Joint Research Centre (JRC), comes into play.

For more than fifty years, the JRC has built up an excellent reputation as a world-class provider of scientific and technical support to European policy-makers and legislators. This report provides brief insights into 2011 highlights, showcasing how the work of the JRC and its network of global partners creates tremendous benefit not only for the European Institutions, but also directly for European citizens. You will see that the JRC spearheads a wide range of initiatives to improve many aspects of our economies and our society, from consumer protection, security and crisis management; to combating climate change; and contributing to energy security and the sustainable management of natural resources.

These are among the big challenges facing society, and addressing them through research and innovation is paramount to finding solutions which enhance our competitiveness.

Last year, for example, I experienced first-hand the JRC's world-class research and modelling skills when visiting the Institute for Energy and Transport with HM Queen Beatrix of The Netherlands. I was especially struck by the motivation of staff and their pioneering spirit to break new ground in areas such as hydrogen storage, environmental testing and smart grids. This ability to constantly adapt its research facilities, equipment and scientific skills base to fast-changing demands from EU policy-makers is evident across the organisation. The feedback I have from senior colleagues and the many services drawing on this scientific support is one of genuine appreciation.

I have great ambitions for the JRC. I have no doubt that the JRC's highly motivated staff will build on their excellent reputation and continue delivering scientific excellence, sound advice and key foresight services, making the JRC the real 'brain of the European Commission'.



Commissioner Máire Geoghegan-Quinn with HM Queen Beatrix of the Netherlands visiting the control room of the High Flux Reactor in Petten.

Foreword by Dominique Ristori

JRC Director-General

2011 has been an important year for the Joint Research Centre. As the only European Commission service in charge of direct research, the JRC has repositioned its activities on scientific support to the key EU policy priorities, in particular Europe 2020 and the Innovation Union. The JRC also reinforced its ties with national governments, key international partners, the science community and the full range of science-led interest groups, particularly industry.

European decision-makers inside the Commission, Parliament and Council are increasingly faced with policy dilemmas requiring solid scientific evidence, in areas such as smart grids, genetically modified organisms, nanotechnologies and dangerous chemicals. Although final decisions remain political, it is important to ensure that scientific evidence is fully taken into account. This is where the JRC, as the only service of the Commission carrying out direct research, has a solid reputation and continues to make its voice heard.

Examples in this report of joint activities undertaken with the European Academies of Science Advisory Council (EASAC), the US National Oceanic and Atmospheric Administration (NOAA), and the Office of the UK Chief Scientific Adviser, Sir John Beddington, fully demonstrate our approach. In addition, a number of key initiatives drawing together senior stakeholders from the full policy arena were organised, including a seminar on the role of science in public-private partnerships in June, a high-level conference on 'Scientific Support to Food Security and Global Governance' in September, and in November, the EU-US Roundtable on 'Building a Transatlantic Bridge'.

In 2011, I made it my task to ensure that the JRC fully delivers on its vision and strategy in support of Europe 2020 and the Innovation Union. With the full backing of Commissioner Geoghegan-Quinn, we have set a course to help address grand societal challenges on a European scale, as well as globally, for which scientific and technological support requires more integrated, pro-active and cross-policy action. These include health, safety and security and energy-related issues such as e-mobility and smart grids. Without doubt, the new JRC positioning represents significant change and implies a new approach to the way we work.

I am glad to report that we have achieved a lot in a short space of time. Closer cooperation has been developed with all partners, particularly in-house customers and Member States, to help define 'pre-policy' orientations. In 2012 and beyond, I aim to continue developing greater corporate capacities to provide proactive policy advice and foresight analysis.

This short report provides just some examples of landmark work completed, or ongoing success stories with partners that have had a significant impact on the lives of EU citizens from the air we breathe, the food we eat or the means of transport or energy source we use. They are testimony to the expertise and commitment of all JRC staff.

The JRC's Director-General Dominique Ristori (front right) and Ricardo Neiva Tavares, Head of the Brazilian Mission to the EU (front left), sign a Letter of Intent for closer cooperation between the JRC and the Brazilian Ministry of Science, Technology and Innovation (MCTI), in the presence of Dilma Rousseff (President of Brazil – back left), Herman Van Rompuy (President of the European Council – back middle) and José Manuel Barroso (President of the European Commission – back right).



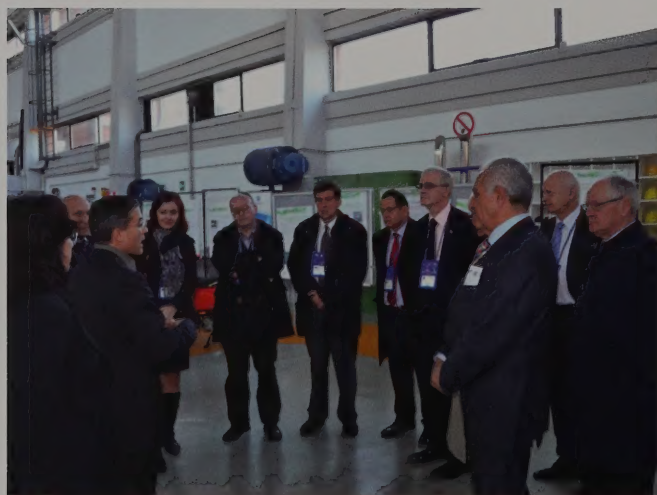
Observations from the Board of Governors

In 2011 the Board of Governors, whose members are nominated by the Member States and Associated Countries to give independent advice to the JRC, continued to provide active support to the JRC's strategy in terms of strategic management and priority setting. The Board met in March, June and November to discuss issues such as Horizon 2020, the setting up of an Ad hoc group on Communications and the interim evaluation of JRC Direct Actions in Framework Programme 7 (FP7).

The Board welcomed the proposed new positioning of the JRC as the only Commission service in charge of scientific research. Based on the successful work of the Board's ad hoc group on Horizon 2020 with the JRC executive, the Board was able to support the JRC proposals for direct actions. The Board also proposes that investments in JRC infrastructures should be increased in Horizon 2020 to ensure facilities are both fit for purpose and provide appropriate energy efficiency. Opportunities to coordinate any new investments in infrastructure with ESFRI should be examined.

The Board discussed the urgent need for the JRC to develop a communications and networking strategy and an ad hoc group was set up for this purpose. This strategy was adopted by the Board and should help the JRC to become more visible in Member States and elsewhere. In this regard important agreements for closer cooperation were concluded for example with the European Academies Scientific Advisory Council (EASAC) and with the Academies of Science of the Danube region.

In 2011, the JRC has provided timely input to the EU policy cycle. In its position as an interface between science and policy, the JRC's work increasingly stretches across different Directorates-General of the Commission. The Board acknowledges the JRC's efforts to raise its visibility within Commission services and fora and encourages it to continue in this vein as this will also lead to further improved knowledge about the JRC in the Member States.



▲ The Board of Governors visited the Vehicle Emissions Laboratories (VELA) at Ispra in November.



▲ Killian Halpin and other members of the Board of Governors at the JRC's European Union Reference Laboratory for GM Food and Feed.

The Board agrees with the importance of modelling as highlighted by the policy DGs. The JRC Director-General will chair a dedicated taskforce which will permit the JRC to address the full policy cycle and to contribute to the impact assessment of policies in support of better regulation. The Board also welcomes the reinforcement of the JRC's foresight and horizon scanning capacities in collaboration with relevant activities in Member States.

At the March meeting the Board was particularly pleased to welcome Jeroen van der Veer, former CEO of Shell. Mr Van der Veer chaired the panel on the interim evaluation of the non-nuclear activities of the JRC under the 7th Framework Programme, whose conclusions and recommendations were welcomed by the Board.

Today's challenges have a global dimension and have to be solved through close international collaboration. The Board notes that the JRC was particularly active in strengthening transatlantic relations, with an important agreement on e-mobility as well as being at the forefront of providing support to the Commission following the Fukushima accident, co-chairing a taskforce on stress tests on European nuclear facilities.

Finally, the Board wishes to congratulate the Director-General of the JRC, Dominique Ristori, for his commitment during the first year of his mandate, during which he has focused his efforts on raising the JRC's profile and underlining the importance of science for EU policymaking.

The Board endorses the present Annual Report and expresses its acknowledgement of the efforts of JRC management and staff in supporting the re-positioning of the JRC.

Front row, from left: José Carvalho Soares, Paolo Venditti, Jan Nieuwenhuis, Ioan Dumitrache, Killian Halpin, Dominique Ristori, Walter Mönig, Christophe Béhar, Karel Aim, Hans Peter Jensen.

Middle row, from left: Hallgrímur Jonasson, Kirsten Broch Mathisen, Ammar Miraščija, Niki Santama, Viktor Nedović, Daniel Weselka, Arjan Xhelaj, Shlomo Wald, Tadeusz Luty, Jaroslava Kováčová, Ulla Engelmänn, Giedrius Viliūnas.

Back row, from left: Bogdan Van Doninck, Aleš Mihelič, Igor Radusinovič, Zdenko Franič, Pierre Decker, Bruno Moor, Erkki Leppävuori, Toivo Räm, Andrejs Šiliņš, Atanas Kocov.



Stability and growth

Stability and growth remained top political priorities of the European Union in 2011. The European Commission proposed new measures to make the financial system more resilient to systemic crises. A key priority is to ensure that the financial sector pays its fair share of the costs for crisis management imposed on public finances. Among the actions to stimulate growth was a new approach to regional development. This again emphasises the importance of EU regions as critical actors of change. Access to raw materials was one of the long term challenges to economic growth that were identified and discussed.

For its part, to support EU efforts for stability and growth, the JRC developed sophisticated systems for modelling and data-processing. It also assessed the impact of different policy choices, built platforms for communication with all relevant partners and used its multi-disciplinary expertise to carry out in-depth studies on issues such as the future availability of raw materials for selected low-carbon energy technologies.

Testing new rules for the financial sector

In 2011, the European Commission presented two proposals for legislation with potentially far-reaching consequences for financial markets. These were: new rules requiring banks to hold more and better capital and a harmonised framework for taxing the financial sector. Both proposals had been tested using a scientific model developed by the JRC.

The proposed rules on capital requirements for banks needed to strike a delicate balance between financial stability and growth; between imposing costs on the banks to enhance

their resilience; and trying to minimise negative impacts on the credit market (especially when these costs are passed on to other actors). The impact on credit markets was also an important concern for the proposed tax on financial transactions, which aims to ensure that the financial sector contributes in a fair way to sustaining public finances, which paid the greatest share of the financial crisis.

The JRC contributed to the assessment of the impact of both proposals by means of a sophisticated statistical model, which it had developed in collaboration with the Commission's Internal Market and Services DG and academia. The SYMBOL model (SYstemic Model of Banking Originated Losses) allows the simulation of potential crises in the banking sector under different assumptions for the regulation in place to prevent them. It examines how different factors, such as tighter capital requirements or the introduction of resolution funds, affect the probability and magnitude of economic losses and liquidity shortfalls due to bank defaults. It can be used to investigate which combinations of regulatory changes are most effective in enhancing financial stability.

When using SYMBOL to assess the impact of the proposed capital requirements in a number of EU countries, the JRC found that the new rules would reduce the risk of systemic banking crises by at least 29% and up to 90% for some EU countries, with an average of about 57% among the analysed countries.

The JRC also used SYMBOL to support the Commission's evaluation of different options to tax the financial sector, such as a tax on high-risk banking activities and a tax on financial transactions of banks, to see which options were more aligned to banks' risk profile and would provide the best incentive for banks to mitigate risks.



Helping EU regions relaunch growth

The role of the EU's regions in relaunching economic growth received increasing attention in 2011. In support of the European Commission's work on enhancing cohesion between different regions and supporting regional specialisation in areas where the regions are particularly strong, the JRC expanded its economic model Rhomolo. This tool, originally created to assess the impact of the EU cohesion policy in the regions of Poland, Germany, Hungary, the Czech Republic and Slovakia, is now to cover all of the EU to study the interlinked economic impacts of investments in different regions. Using real data and different assumptions, the model can simulate interregional trade, total factor productivity and endogenous growth, monopolistic competition and geographic agglomeration factors.

The JRC also contributed to the Smart Specialisation Platform, which was launched by the Commission in June to encourage regions to specialise in certain areas where they have a competitive advantage.



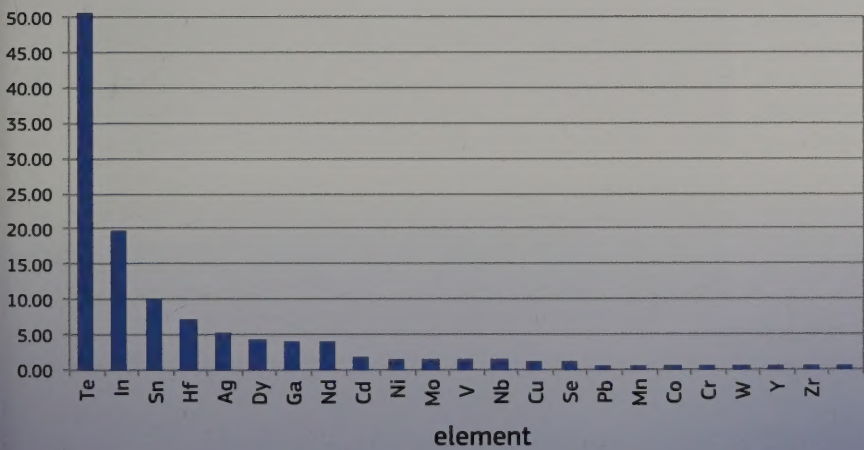
Critical metals in strategic energy technologies

Low carbon energy technologies have increased the demand for certain rare earth metals, which are almost exclusively supplied by China. The EU is tackling this problem, as well as that of other critical raw materials, through its Raw Materials Initiative and the proposed European Innovation Partnership on raw materials. In support to these initiatives, the JRC carried out a study to assess the demand for such metals and supply chain bottlenecks in the production of six of the most important low-carbon energy technologies as specified in the Strategic Energy Technology Plan, i.e. nuclear, solar, wind, bio energy, carbon capture and storage and the electricity grid.

The study showed that photovoltaic systems and wind turbines are the technologies for which access to critical raw materials is most important. Photovoltaic systems use tellurium, indium and gallium, while wind turbines rely on neodymium and dysprosium.

Today, tellurium and indium are the metals with the highest EU demand for low-carbon technologies. The demand for neodymium and dysprosium is likely to increase as these metals are extensively used in a new promising line of wind turbines.

% percentage



Implementation of the Strategic Energy Technology Plan by the EU by 2030 will require significant amounts of critical raw materials. The graph shows the need for critical metals in percentage of 2010 world production.

Scientific support to Innovation Union

The Innovation Union is one of the flagship initiatives of the European Commission's Europe 2020 strategy for jobs and smart, sustainable and inclusive growth. The JRC supports the Innovation Union by identifying obstacles to innovation, assessing different strategies to meet the complex challenges and monitoring closely progress made.

Comparing worldwide investment in R&D

Every year, the Commission publishes the Industrial R&D Scoreboard which is prepared by the JRC. The Scoreboard ranks the world's top companies by their investments in research and development and contains information on 1 000 EU-based companies and 1 000 non-EU-based companies. In 2011, their combined R&D investment totalled €463.6 billion, equivalent to almost 85% of the total expenditure on R&D by business worldwide.

The Scoreboard shows that the US dominates in sectors with high R&D intensity and that the EU dominates in sectors with medium-high R&D intensity. Sector by sector, EU companies have similar or greater R&D intensities than their international competitors – including in sectors such as technology hardware and equipment; automobiles and parts; aerospace and defence and electronic and electric equipment. However, the overall R&D in-

tensity of the EU is lower than that of the US because of the composition of the EU industry. This suggests that in order to reach the same R&D intensity as the US, the EU would need to make substantial changes to its industry sectors.



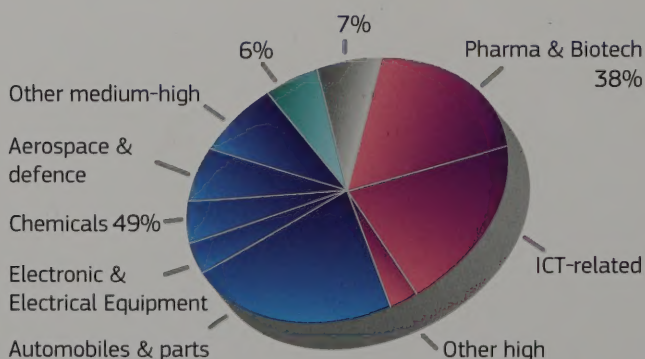
Keeping track of Innovation Union

The Innovation Union flagship identifies the main obstacles to innovation and sets out to address them via 34 commitments. These include training a sufficient number of researchers in EU countries to meet national R&D targets, or facilitating mobility and cross-border cooperation in Europe.

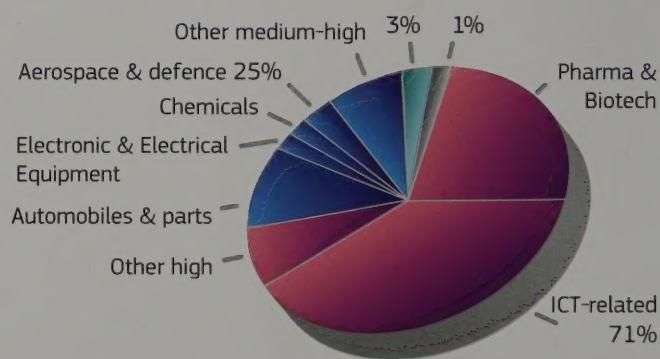
The JRC has set up the Innovation Union Information and Intelligence System (I³S), an on-line service that gives a comprehensive and regularly updated overview of progress in relation to each of the 34 commitments, with a great wealth of additional information. I³S was officially launched in December by the JRC together with the Commission's Research and Innovation DG.

The JRC also supports the Commission's Innovation Union Scoreboard, which is composed of 24 indicators which were set up to monitor the EU countries' progress in creating fertile environments for innovation.

EU 2011



US 2011



● High ● Medium-High ● Medium-Low ● Low

Categories of R&D intensity

R&D investment of EU and US companies by industrial sector.
Source: The 2011 EU Industrial R&D Investment Scoreboard.

Information and communications technology leads innovation

The Information and Communications Technology (ICT) sector plays a key role in economic growth. It accounts for 25% of total business investment in R&D, and provides other sectors with innovative productivity-enhancing technology. ICT services in 2008 represented 3.7% of the EU's GDP and 6.2 million jobs, while ICT manufacturing represented 1% of GDP and 2 million jobs.

On behalf of the European Commission's Information Society and Media DG, the JRC maps investments in R&D in the ICT sector and its economic performance. This is done through a research project called PREDICT. The project combines national statistics, data on investments, patents, and the location of R&D centres.

Despite its importance for the European economy, the European ICT sector lags behind its main international competitors in terms of R&D investments and patents. This is largely due to the fact that the EU has smaller and fewer ICT companies than the US and Japan.

Advancing technology transfer in Europe



▲ In October the JRC and the Commissariat à l'Energie Atomique et aux Energies Alternatives (CEA) signed a Memorandum of Understanding within the European TTO Circle.

In October 2011, the European Technology Transfer Offices (TTO) Circle was launched, a JRC-led network of the technology transfer offices of 21 of the largest public research organisations in Europe. Technology transfer is the process through which research organisations make their skills, technologies and tools widely available, to allow innovative businesses to develop them further, turn them into new products and services and bring them to market. The European Union has world class researchers, entrepreneurs and companies, but technology transfer is still at an early stage, with a fragmented landscape and great disparities in terms of performance.

The European TTO Circle was set up by the JRC in direct response to the Innovation Union commitments. It aims to bring together the major public research organisations to encourage best practice sharing and increased coordination, thereby strengthening Europe's ability to create innovative products and services for the market.

Putting the science into standardisation

In 2011, the Commission presented a strategy for European standardisation, which notes the strategic importance of standardisation to the European economy, and stresses the importance of science to standardisation. This strategy specifically acknowledges the JRC's importance in this field.



▲ Setup of a large-scale structural test (industrial building shear-wall) at the European Laboratory for Structural Assessment (ELSA) Laboratory: Hydraulic high-pressure hose connection to the actuator's servo-valve.

The JRC has, for many years, supported the standardisation process in its many areas of activity. For example, it carries out prenormative research to establish a level playing field for industrial cooperation and a predictable regulatory environment for future market development in collaboration with European and international standards organisations. Among the highlights of the JRC's efforts in the area of standardisation is the work on e-mobility and smart grids (see Chapter 4). Its newly created European reference laboratory for the electrical performance of photovoltaic devices based on emerging technologies is providing a unique, independent reference function at the European level. Other examples range from design codes for buildings to work on nanomaterials. The JRC has contributed to the development of the European advanced design codes for the building sector ("EUROCODES"), in particular EUROCODE 8, which concerns the design of structures for earthquake resistance. In 2011, the JRC's work in this field was extended to also cover health, energy efficiency and sustainability.

In 2011, the JRC developed harmonised test methods and measurements for nanomaterials, to correctly identify potential hazards and develop methods for risk assessment. The JRC also developed and made available reference nanomaterials and worked with its partners in support of the EU recommendation for a definition of nanomaterials in October.

Energy and transport

The EU has set itself ambitious targets for 2020 in terms of sustainable energy: cutting greenhouse gas emissions by 20% (compared to 1990 levels), reducing its energy consumption by 20% (compared to projected levels) and increasing its use of renewable energy to 20% of the total energy mix. Meeting this challenge will require, among other things, the transformation of our electricity infrastructure and a shift towards cleaner forms of transport.

The JRC supports the EU transition towards a low carbon economy in a number of ways. Among them are its research on 'intelligent' power transmission and distribution systems (smart grids). This focuses on energy efficiency, security of supply, security from cyber attacks and interoperability. On the transport front, the JRC has made research on e-mobility one of its priorities, working on standards and interoperability in close contact with its transatlantic partners.

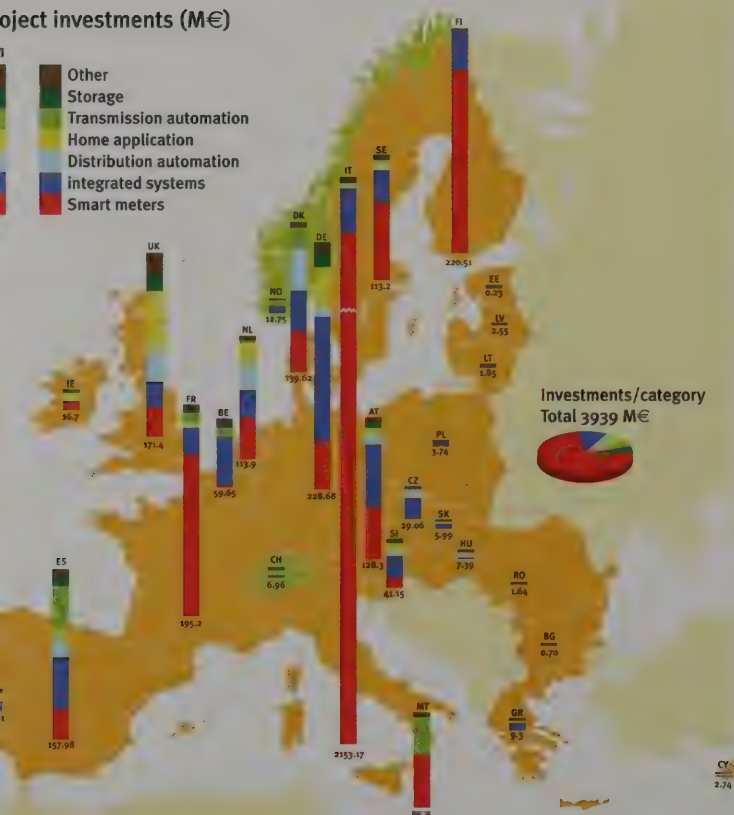
Tracking smart grid projects and preventing cyber-threats

Intelligent electricity networks – smart grids – a key component in the EU energy strategy. They enable a two-way exchange of information and power between producers and consumers, leading to increased transparency and promoting responsible energy saving measures for consumers.

In June 2011, the JRC presented a review of 219 smart grid projects Europe-wide. This represents the most updated and comprehensive inventory of Smart Grid projects ever undertaken in Europe. The vast majority of investments, amounting to about €5.5 billion, were made in EU-15 countries, while EU-12 countries tended to lag behind. By providing a complete catalogue of the projects to date, the report shows how smart grids can help integrate more renewables, accommodate electric vehicles, give more control to consumers over their energy consumption, avoid blackouts and restore power more quickly when outages occur.

By using the Internet as their underlying control layers, energy infrastructures have evolved from isolated physical systems into complex cyber-physical systems. The JRC has started a research project to identify and develop ways to prevent threats to these systems, such as manmade errors, deliberate cyber-attacks and natural disasters.

In 2011, the JRC's unique Experimental Platform for ICT Contingencies (EPIC) was extended in order to allow researchers to conduct repeatable real-time experiments with simulated physical systems tightly coupled with real cyber systems. The results demonstrated the magnitude of the threat posed by isolated and coordinated cyberattacks. This helped provide, for the first time, experimental evidence that today's heavily interconnected power grids are highly vulnerable to sophisticated cyber-attacks and that they require coordinated actions of grid operators in the event of crises.



Geographical distribution of investments by type of project.

Transatlantic research cooperation on e-mobility

The JRC and the US Department of Energy in November 2011 agreed to establish two Scientific Interoperability Centres. One will be hosted at the JRC in Petten and Ispra and the second at Argonne National Laboratories in the US. They will work to ensure that hardware and software, including communications, used in the EU and in US are interoperable, to facilitate innovation, manufacturing and trade.

New concepts and innovative technologies in fully electrified and hybrid cars need to be tested to ensure their reliability during all seasons, as well as their energy-efficiency and operational safety. This includes the car's batteries, charging link and communication with the smart electric grids of the future. In 2011, the JRC extended its Vehicle Emissions Laboratory (VELA) to encompass testing and development of electric vehicles. The research will cover aspects related to safety and vehicle performance with respect to driving range, energy efficiency and durability of the engine. In parallel, complementary research in Petten will address vehicle batteries.

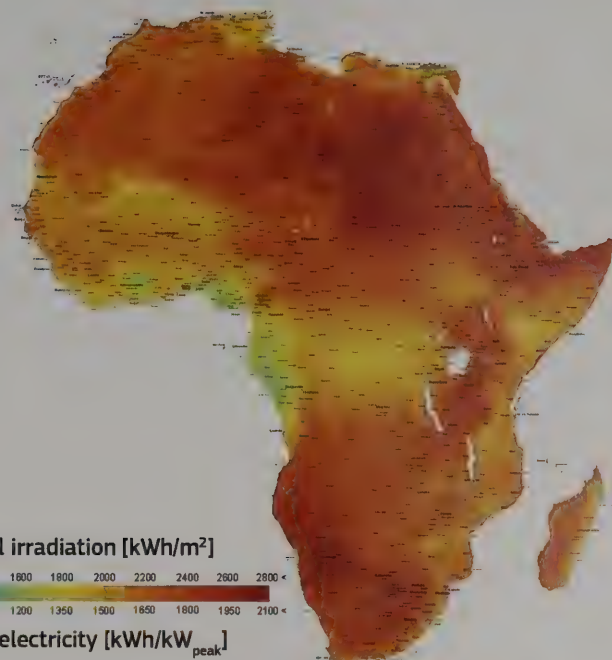
The signature of the collaboration agreement between the JRC and the US Department of Energy followed the high-level seminar "Building a Transatlantic Scientific Bridge" which was organised by the JRC and co-hosted by the US Ambassador to the European Union, Mr William Kennard, in Brussels on 21 November 2011.

Renewable energy in Africa

The JRC report "Renewable Energies in Africa" is the first comprehensive mapping of the use of renewable energy in all African countries. It estimates their energy consumption and current share of renewables, as well as the technical potential of available resources of solar, wind, biomass and hydropower which could be economically used to provide energy for the growing population.

According to the report, the typical per capita energy consumption is approximately 35 times lower than the EU per capita consumption. The average consumption of electricity is approximately one percent of the EU average, partially due to the fact that almost 600 million citizens living in rural areas still have no access to electricity.

The report points out that due to the relatively elevated costs of conventional grid expansion to rural areas, renewable energy options for electricity production are often an economically viable alternative, thanks to their decentralised power generation.



The "Renewable Energies in Africa" report shows that renewable energy technologies in many cases are the cheapest means of providing energy to many parts of the continent.

Energy efficiency: a win-win situation for all

Energy efficiency has been highlighted as the fastest and most cost-effective way to reduce emissions of greenhouse gases, while at the same time increasing security of supply and saving money for the consumer. In support of the national energy efficiency action plans that EU countries have to provide under EU legislation on energy efficiency and energy services, the JRC has developed methods to measure energy saving at a national level and has assessed the plans supplied by all EU Member States.

The JRC has also helped develop a methodology for assessing minimum energy performance requirements for buildings and building elements and calculating the cost-optimal levels. It coordinates the Green Building Programme to improve the energy efficiency of non residential buildings through refurbishment or by setting high energy efficiency standards for new buildings, and the Green Light Programme to reduce energy consumption from indoor and outdoor lighting in the non-residential sector. As an illustration of the potential energy efficiency gains that can be made, one winner of the 2011 Green Building Awards cut its energy consumption by over 78 %. A Green Light Award winner reduced its annual energy consumption for lighting by 20 000 Megawatt hours, a 60% reduction.

Other work by the JRC includes the Codes of Conduct to improve energy efficiency in data centres and broadband equipment. Currently, 103 leading IT companies have adopted the Codes of Conduct, achieving substantial energy savings.



Environment and climate change

The European Union plays a major role in international negotiations on climate change to reduce emissions of greenhouse gases and mitigate the impact of climate change. The JRC supports policy formulation in this field by developing integrated economic assessment models of climate and low-carbon-related policy options.

The JRC's work in support of environmental policy comprises a wide range of fields. For example the JRC carried out work in support of the first EU 'end-of-waste' legislation, which entered into force in October 2011.

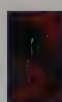
Improving air quality and mitigating climate change

In 2011, the JRC contributed to a study identifying measures to control emissions of black carbon and methane that would at the same time limit global warming and improve future health and food security. According to the study, the 14 envisaged emission control measures would help prevent up to 5 million annual premature deaths from air pollution, and increase annual crop yields by 30-135 million tonnes. The benefits of methane reductions were estimated at USD 700-5 000 per tonne. If immediately applied, and in conjunction with measures to reduce emissions of carbon dioxide, the methods could help mitigate warming in the Arctic and Himalayas, and reduce regional disruption to traditional rainfall patterns.



▲ *The JRC supports policy making to reduce emissions of greenhouse gases and mitigate the impact of climate change.*

The study "Simultaneously mitigating near-term climate change and improving human health and food security", builds on the United Nations Environment Programme (UNEP)'s (2011) Integrated Assessment of Black Carbon and Tropospheric Ozone. The study was compiled by thirteen partners from all over the world, including the JRC, UNEP, NASA and the Stockholm Environment Institute.



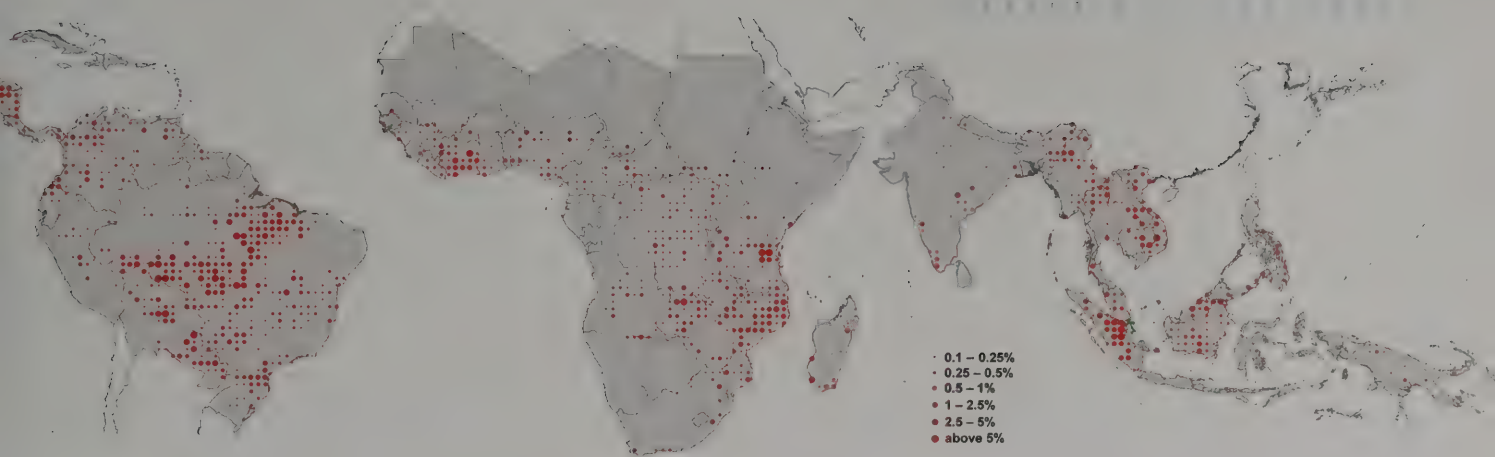
Scrap metal: a valuable resource



▲ *The 'end-of-waste' legislation aims to make it easier to recycle high quality waste such as scrap metal.*

EU and global markets are gradually realising the value of waste as a secondary raw material. However, the strict control methods that apply to all waste – even high-quality material such as scrap metal from construction sites – have stopped waste from realising its full recycling potential. Defining when waste ceases to be 'waste' and can be considered and sold as any other raw material is particularly important for ferrous and non-ferrous metals, paper, glass and biodegradable waste.

In October, the first EU legislation on the 'end-of-waste' entered into force. The regulation covers scrap metals such as iron, steel and aluminium and lays down that clean and safe scrap metal no longer has to be classified as waste and can be put on the market just like virgin metal commodities. These criteria were based on technical work by the JRC. The JRC has also carried out work in support of future pieces of 'end-of-waste' legislation for other categories of waste (waste paper, copper, glass and biodegradable waste).



▲ Annual rate of gross forest cover loss per sample unit for the period 2000-2005.

Contributing to the FAO Global Forest Remote Sensing Survey

In November 2011, the JRC together with the UN's Food and Agriculture Organization (FAO) presented their joint report on "Global forest land-use change from 1990 to 2005", which gives the initial results of the latest FAO Remote Sensing Survey. The Survey was conducted by the FAO and the JRC in collaboration with US scientific partners, and included over 200 national experts from 106 countries.



◀ In November, the JRC and the Food and Agriculture Organization published a report, "Global forest land-use change from 1990 to 2005".

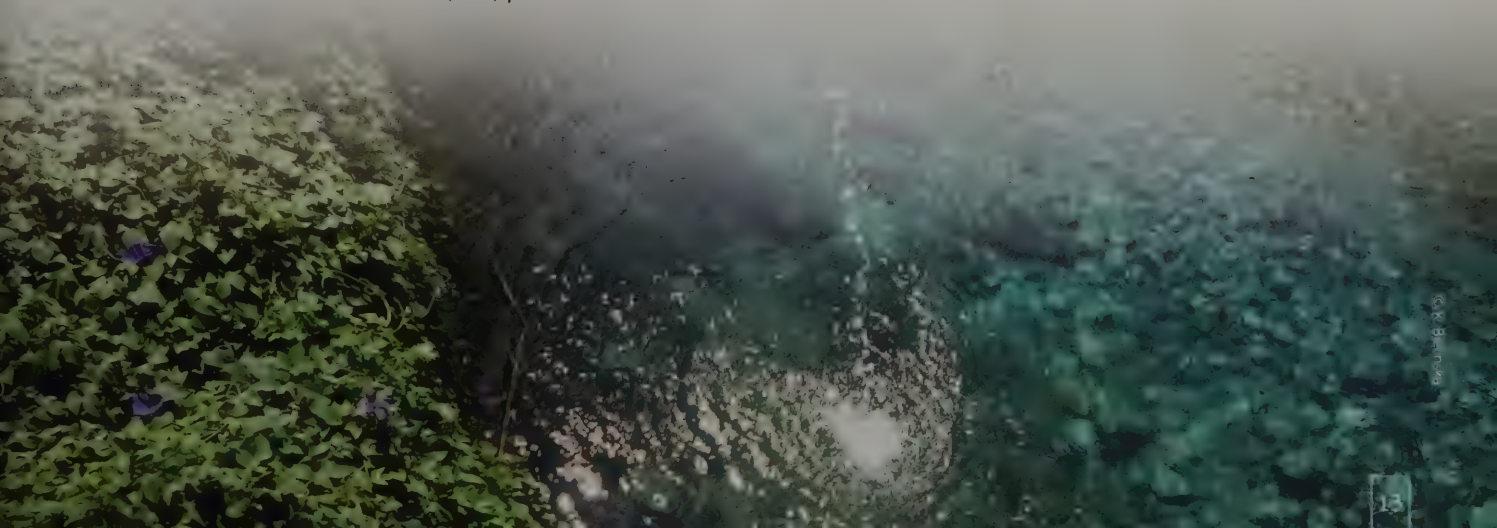
It provides estimates of forest areas based on a global sample of satellite imagery and gives new estimates of forest area change rates (deforestation and afforestation) for the time periods 1990-2000 and 2000-2005.

The JRC was in charge of processing and analysing the satellite imagery for the tropical regions and the EU territory. Results from 15 validation workshops organised in the tropics and in Europe, involving over 150 experts, were used to compile the forest cover change maps for these regions. More than half the world's forests are in tropical or subtropical regions. These areas also show the highest rate of forest loss over the periods surveyed. The methods the JRC developed for the Survey will feed into the continuous improvement of the FAO Forest Resources Assessment (FRA) process.

Assessing and monitoring pollutants in soil and water

Water protection is one of the main environmental priorities of the Commission. To support EU measures for cleaner rivers and lakes, groundwater and coastal beaches, the JRC carries out extensive work to assess the impact of pollutants in terrestrial and aquatic ecosystems and studies the potential future impact of the substances as they break down in the environment. These activities dovetail with EU environmental legislation and international conventions.

The JRC coordinates several campaigns to measure and monitor nutrients and chemicals: industrial, agricultural and domestic persistent organic pollutants (POPs), e.g. polychlorinated biphenyls (PCBs), polar compounds, pesticides, herbicides, insecticides, pharmaceuticals and personal care products at regional and pan-European level. This is complemented by modeling-based scenario analyses of the impacts of policy options to control pollutant emissions to aquatic bodies. In 2011, this wealth of information was made available through several interactive maps that allow users to identify, at a European or regional scale, "hotspots" of pollutants, their fluxes and their proximity to ecosystems.



Agriculture and food security

Food security, which relates to the availability of food as well as the access to it, is a key requirement for global sustainable development. According to the UN, food insecurity already affects more than 1 billion people. A tenth of this population is at risk of starvation due to natural hazards or man-made crises.

Given the importance of this issue, the JRC organised a major stakeholder conference on "Scientific support for Food Security and Global Governance" to foster debate and explore how science, technology and innovation could contribute to food for all. The JRC was able to draw on its extensive work in this field ranging from crop monitoring and forecasting in food-insecure regions to assessment of the price volatility of the global food markets.

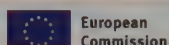
Other highlights include a detailed analysis of the impact of a trade deal between the European Union and Mercosur and new technologies developed in support of sustainable fishing.



Food price volatility



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Since 1990 some progress has been made towards the Millennium Development Goal target of halving the proportion of people suffering from hunger. However, the food crisis of 2007-2008, provoked by steeply increasing food prices, made price volatility a widely recognised global problem. In 2011, food prices reached new peaks, leading to an increasing number of undernourished people.

JRC research shows that most agricultural commodities have experienced rising price volatility, such as maize, soybean, rice and cotton, and that agricultural commodity prices are likely to remain volatile in the foreseeable future. Several factors were identified that drive the volatility of agricultural commodities' prices. Looking at the development of wheat prices over the last 30 years, most of the price volatility for wheat was closely linked to the volatility of petrol prices and exchange rates. Stocks and a moderate level of speculation appeared to reduce volatility.

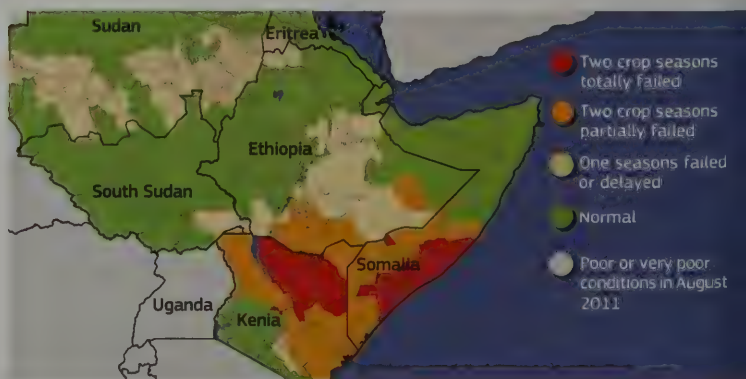
In September, the JRC organised a high-level conference on Scientific Support for Food Security and Global Governance in Brussels. The conference, attended by over 380 participants, brought together 21 speakers representing national governments, international organisations, EU institutions, industry, NGOs and research organisation.



Global food security monitoring

Since 2001, the JRC assists the EU Food Security Thematic Programme, with particular focus on Africa. JRC scientists operate a crop monitoring and yield forecasting system that combines satellite observations and agro-meteorological modelling. Special bulletins on crop production are produced to inform decision makers on food security conditions in the most food-insecure regions, mainly in Sub-Saharan Africa. In 2011, the JRC provided early warning on the drought that hit the Horn of Africa sufficiently in advance to help humanitarian intervention planning.

The analysis of the extent and impact of the drought showed that two consecutive crop seasons had partially or totally failed in several districts of Northern and Eastern Kenya, Southern Ethiopia and Southern Somalia, putting more than



With its crop monitoring and yield forecasting system, the JRC could provide early warning on the food insecurity in the Horn of Africa.

10 million people in conditions of critical food insecurity. The JRC contributed to the implementation of the Integrated Food Security Phase Classification (IPC) used by the United Nations to declare famine in some areas of Somalia.

New technologies for sustainable fisheries

In 2011, the Commission launched its proposal for a thorough reform of the EU's fisheries management system, the Common Fisheries Policy (CFP). The JRC supports this policy in a number of ways, among them the management of data and the provision of scientific advice. It supports EU efforts to combat illegal, unreported and unregulated (IUU) fishing through its expertise in genetics and genomics as well as surveillance and remote sensing.

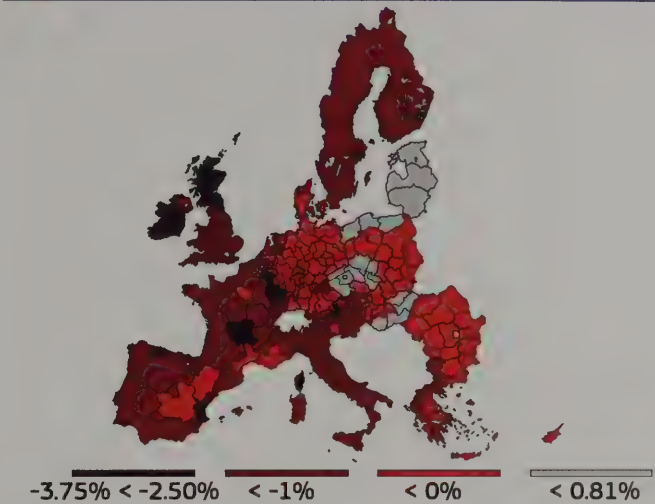
To combat fraudulent labelling of fish and fish products, the JRC and its partners developed a method to accurately determine from which particular local population a fish came. The researchers demonstrated that ten genetic markers were sufficient to reveal with near-perfect accuracy if a hake came from the Atlantic or from the Mediterranean Sea. The method was demonstrated on selected fish species of high commercial value. This method can help fight illegal fishing, improve traceability of fish and fish products from "ocean to fork" and thereby contribute to sustainable fisheries management. The JRC reference report "Deterring illegal activities in the fisheries sector" describes how molecular methods enable fish species and origin identification, even in processed products. It was publicly released by Maria Damanaki, European Commissioner for Maritime Affairs and Fisheries, on 27 May 2011 during the Slow Fish event in Genoa (Italy).

Maria Damanaki, Commissioner for Maritime Affairs and Fisheries, with the JRC report «Deterring illegal activities in the fisheries sector» at the Slowfish event in Genova in May.



The JRC also developed a new habitat model which makes it possible to track the potential presence of bluefin tuna shoals through daily updated maps. Based on satellite remote sensing data of the sea surface, the model provides for the first time an overall view of the bluefin tuna's preferred habitats in the Mediterranean Sea, as well as their changes over time, which should help fisheries managers to better target their efforts to protect the stock.

Potential impact of an EU-Mercosur trade deal



Estimated change in revenues from all agricultural activities (per ha) following a possible EU-Mercosur trade agreement.

Following a request from the Commission's Agriculture and Rural Development DG, the JRC carried out an impact assessment of a potential EU-Mercosur free trade agreement. JRC analysis has shown that a trade deal between the European Union and Mercosur, the economic trade block of Argentina, Brazil, Paraguay and Uruguay, would result in a patchwork of winners and losers. Simulations were made with two different global economic models called GLOBE and CAPRI. GLOBE covers the impacts on the economy of all sectors in all the countries modelled, whereas CAPRI provides a detailed EU-wide spatial impact analysis according to individual agricultural commodities.

Although the overall net economic impact of a free trade agreement would be positive for the EU, ranging from €8.9 billion to €66.0 billion depending on different scenarios, the simulation shows that the possible economic losses and the adjustment pressures arising from a bilateral trade agreement between the EU and Mercosur would fall heavily on the EU's agricultural sector. The gains to other sectors would be widely diffused and the magnitude of these gains relative to the EU economy as a whole would be relatively modest.

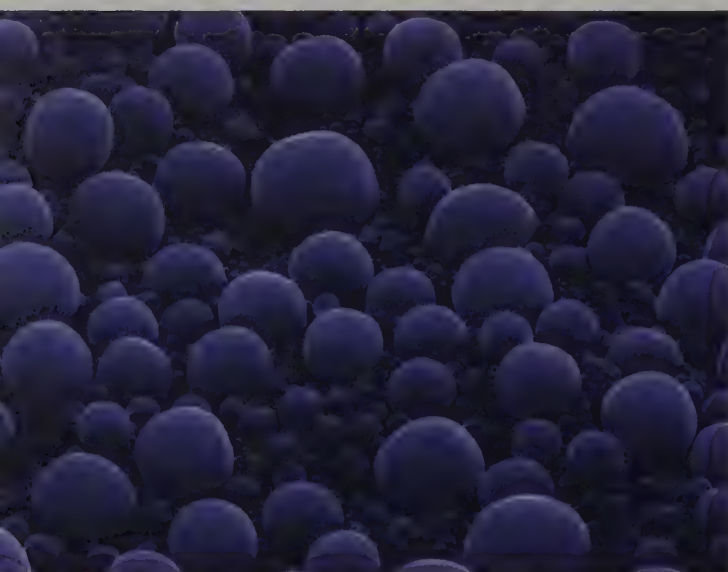


Health and consumer protection

The safety and quality of food and consumer products is of major concern not only for consumers, but also for producers and regulators at national and EU level. Safety concerns can also arise on non-food consumer products such as toys, cosmetics and textiles. EU legislation addresses both categories, and needs harmonised and effective testing systems to be applied. The JRC supports EU policy by providing EU-wide harmonised testing methods for food contact materials and chemical safety of food, as well as on safety and quality of consumer goods. The JRC also carries out research on nanomaterials, a promising technology for EU competitiveness which needs to be carefully assessed against risks to public health and the environment.

Assessing the safety of nanomaterials

Nanomaterials are already being used in hundreds of applications and consumer products and are an important driver of European competitiveness. The JRC provided scientific and technical input to the Commission's recommendation on a definition of nanomaterial, which was issued in October 2011.



Tin nanoparticles synthesized and photographed by the JRC.



Sir Brian Heap, President of EASAC, and Dominique Ristori, Director-General of the JRC, signed an agreement for closer cooperation between both organisations on 18 October 2011.

Together with the European Academies Science Advisory Council (EASAC), the JRC published a report on the state-of-the-art knowledge on the safety of engineered nanomaterials which concludes that to date, there is only limited scientific evidence to suggest that nanomaterials present a risk for human health. The report calls for harmonisation of test protocols and stresses that regulators and researchers need to work together to identify priorities.

In 2011, the JRC released the world's first certified nanoparticle reference material based on industry-sourced nanoparticles, to help ensure the comparability of nanoparticle size measurements worldwide. The new material (ERM-FD100) consists of silica nanoparticles of a nominal diameter of 20 nanometres, which are amongst the most widely used nanoparticles at the moment and are used in products such as polish, whiteners and dispersants. The reference material provides a basis for reliable hazard assessments, and it also enables producers of nanoparticles to monitor production quality over time against a stable reference point. Particle size was measured in collaboration with 33 laboratories from 11 different countries in Europe, America and Asia, thus bringing together expert knowledge from across the globe.



Interlaboratory comparison on cadmium and lead in baby food

Infants are particularly sensitive to exposure to chemicals as they have a very high consumption of food compared to their body weight. Upon request by the European Commission's Health and Consumers DG, the JRC carried out an inter-laboratory comparison to investigate the capability of analytical laboratories to measure very low levels of cadmium and lead in baby milk formula. Sixty-one laboratories from more than 20 countries participated in the exercise. Each participant analysed the content of cadmium and lead on both a powder sample and a reconstituted sample (i.e. powder mixed with water to resemble the product as consumed).

The tests showed that all laboratories measured cadmium more accurately than lead. Eighty five per cent of laboratories had satisfactory results for cadmium in the powder sample, while only 23 % were able to measure lead in a powder sample in a satisfactory way. The results for lead showed that one particular analytical method (atomic absorption) was clearly less suitable, because the method was not sensitive enough at such low levels. Another important outcome of the exercise was a clear recommendation that maximum limits in European legislation be expressed for the powder form, rather than for the reconstituted (i.e. as-consumed) product.



Safety testing for plastic kitchenware imported into the EU

From July 2011 onwards, the safety testing of polyamide and melamine plastic kitchenware imported from China and Hong Kong is carried out according to technical guidelines developed by the EU Reference Laboratory for Food Contact Materials, hosted by the JRC, in collaboration with its Network of National Reference Laboratories. The technical guidelines provide all practical information on sampling, migration testing and methodologies for the analytical determination of compounds which may migrate into food from kitchenware. These include primary aromatic amines, released from polyamide, a family of compounds where some are carcinogens. The level of formaldehyde, released into food from melamine kitchenware imported from China, has been often reported to be higher than authorised in the EU.

The guidelines are used by laboratories to provide unified sampling and testing procedures for kitchenware made of polyamide and/or melamine. The harmonisation of sampling will greatly increase the level of confidence in guaranteeing the safety of imported goods, as well as in any ensuing legal decisions for articles non compliant with EU legislation.



Testing for dangerous substances in sports drinks

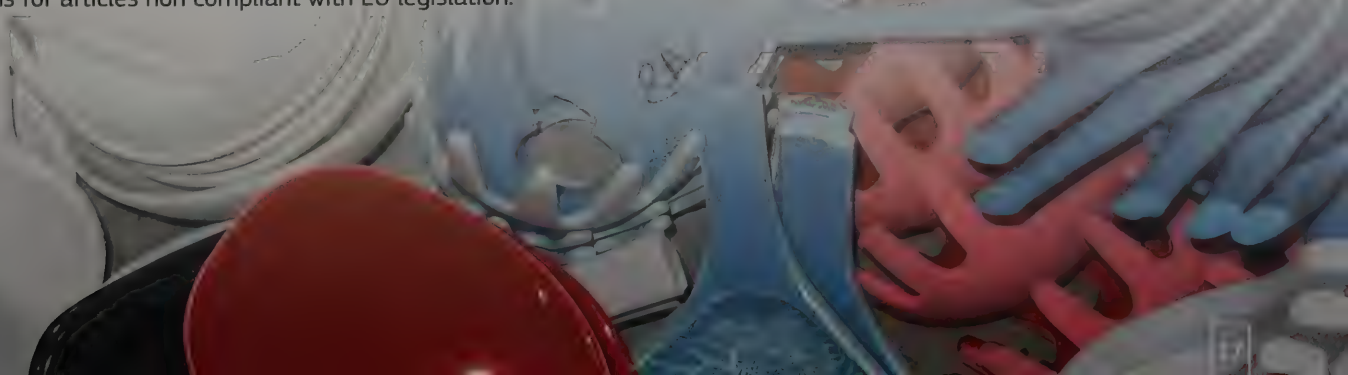
In 2011, the JRC developed three new analytical methods to detect phthalates which had been used as illegal clouding agents in sports drinks imported from Taiwan. As phthalates are believed to affect reproductive performance and fertility and have been linked to developmental problems with children, they are prohibited in the production of food, and their use in plastic toys and childcare products is restricted in the EU. The Taiwanese Food and Drug Administration published the names of 879 products of more than 300 producers that contained high amounts of phthalates. More than 200 products from 34 producers were exported to 22 countries, among them Germany and the UK, where some products were withdrawn from the market.



▲ *Significant amounts of phthalates were illegally added to certain sports drinks.*

Following a request from the European Commission's Directorate-General for Health and Consumers, the JRC developed and validated three new testing methods that allow the substance to be rapidly and accurately detected. The methods were made freely available on the JRC website, to help those laboratories in the EU and worldwide testing suspected products.

Producers of sports drinks, jelly and fruit pulps typically use products based on palm oil to obtain a cloudy appearance, but in the Taiwanese incident, such products were replaced by two phthalates, which were cheaper.



Safety and security

The EU is committed to the safety and well-being of its citizens. Threats can come from natural hazards, such as earthquakes and tsunamis, or can be intentional, such as illicit trafficking of nuclear material, or from a combination of factors which, in the case of nuclear waste can have serious consequences. The JRC puts its expertise and its state-of-the-art equipment at the service of EU policy, allowing for increased global surveillance and early detection of potential hazards, as well as the protection of Europe's critical infrastructures. For example, the JRC is using its nuclear expertise to coordinate stress tests for Europe's nuclear facilities following the Fukushima disaster, as well as in supporting the European Commission's work to ensure the safe storage of nuclear waste. The JRC has also developed a tsunami alerting device and has started a scientific project to analyse the impact of space weather on Europe's critical infrastructures.

Nuclear stress tests and post-Fukushima support

Following the accident at the Fukushima Daiichi nuclear power plant, the JRC-led Clearinghouse on Operating Experience Feedback for Nuclear Power Plants provided daily technical updates on the situation at the Fukushima Daiichi nuclear power plant and at the other Japanese nuclear facilities affected, from the very first days of the accident. These updates were broadly disseminated and used in the EU Member States. The Clearinghouse was established in 2008 at the JRC to support the EU's activities on the evaluation of nuclear power plant (NPP) operations and dissemination of lessons learned.

To avoid similar accidents, the European Council subsequently called for a review of the safety of all EU nuclear power plants – the so-called 'stress tests'. Fifteen EU countries participated in the review, together with Switzerland and Ukraine. The JRC, through the Clearinghouse provides the Secretariat for the stress tests and is the rapporteur of the peer reviews. It co-drafted the report on the progress of the stress tests that was presented by the European Commission to the European Council in December, 2011. No major issue had been noted but some potential safety improvements were identified to increase robustness. The JRC will participate in the peer reviews that constitute the final stage of the stress tests and are scheduled for early 2012.

In addition, the European Commission's information exchange system for nuclear emergencies EURDEP delivered aggregated data both for the Commission services, members of the 33 countries strong network, and to the general public through its website (<http://eurdep.jrc.ec.europa.eu>). In collaboration with the International Atomic Energy Agency, the system will expand from European to a world-wide coverage.

The Fukushima accident also gave rise to further analyses focused on specific aspects of fuel behaviour in accident conditions. To this end, the JRC worked in direct contact with Japanese research groups. First results of tests on irradiated BWR fuel corrosion in seawater, analysis of high temperature fuel effusion and vaporization behaviour, are currently evaluated and compared to previous studies on fuel samples from simulated and real severe accident conditions.

Safe storage and disposal of high level nuclear waste

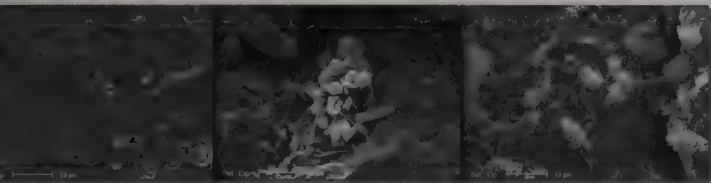
In support of the European Directive on Safe and Responsible Management of Spent Fuel and Radioactive Waste, which entered into force in 2011, the JRC has set up a working group together with an expert group of the European Nuclear Energy Forum (ENEF), to support the safe, responsible and harmonized future management of spent fuel and radioactive waste throughout the European Union.

The JRC is also involved in the Implementing Geological Disposal Technology Platform as the forum for guiding research, development and demonstration activities on future disposal at the European level. Several EU countries are currently building geological repositories for their spent fuel.



 The JRC worked directly with Japanese research groups following the Fukushima disaster.

While these are being set up, the temporary storage time is prolonged. It is therefore important to assess the chemical and mechanical integrity of spent fuel rods during extended storage and subsequent handling and transportation to the final repository or in case the spent fuel needs to be retrieved from the repository in future.



Scanning electron microscopy micrographs showing the surface morphology of uranium oxide fuel compounds and highlighting effects of water corrosion.

The JRC focuses on reducing the scientific uncertainties associated with the medium and long-term prediction of waste behaviour. It is developing and implementing advanced facilities and competences, covering different types of spent nuclear fuel, to address the key processes and alteration/corrosion mechanisms in view of conditions characterised by contact of fuel with groundwater in the distant future. This research is embedded in broad European projects, networks and programmes where the partners benefit from the JRC's state-of-the-art experimental facilities and competence in dealing with highly radioactive materials.



Early warning of tsunamis and other disasters

In April 2011, in collaboration with the local civil protection authority, the first prototype of a Tsunami Alerting Device (TAD) was installed on a beach in Setubal, Portugal. Developed by the JRC, the TAD aims to alert the population at risk of a tsunami. Alert messages are automatically displayed on the screen of the TAD while sirens are activated and loudspeakers transmit instructions. The TAD is unique as its activation can be triggered automatically based on the large global tsunami scenario database of the Global Disaster Alert and Coordination System or on the basis of parameters measured locally, such as high sea water levels. It not only receives but also transmits data recorded by its temperature and pressure sensors. It can be set to send out automatic alerts arriving from other systems, and can also be activated manually via commands from a web site.

Monitoring systems and flood forecasting are part of the areas that JRC and Brazil agreed to reinforce collaboration on at the 5th EU-Brazil Summit held in October 2011. The first result of the collaboration will be to assist the Brazilian National Centre for Monitoring and Early Warning of Natural Disaster, in São Paulo. With its expertise in monitoring systems and disaster prevention, the JRC will provide support and exchange information with the Ministry for Science, Technology and Innovation (MCTI) on flood forecasting and monitoring.



Space weather: a potential threat to critical infrastructures

Many modern technological infrastructures critical for the well-being of society are vulnerable to the impact of geomagnetic storms – a recurring natural hazard caused by solar activity. Preliminary studies show that the economic and societal costs of a severe geomagnetic storm could be potentially significant to space- and ground-based infrastructures and services such as satellites, electrical power grids, telecommunication networks, navigation, transport or banking.

In view of the upcoming solar maximum, which is the period of greatest solar activity in the solar cycle of the sun, expected in early 2013, the JRC organised a high level stakeholder meeting to raise awareness of the potential risks and to improve the understanding of the space-weather impact on critical infrastructures. Over 70 representatives of government, industry and academia discussed the scientific, operational and policy challenges for reducing the risks of extreme space weather to critical infrastructures and recommended concrete actions to protect the critical services they provide. Space weather was also included in a Letter of Intent signed between the JRC and the US National Oceanic and Atmospheric Administration (NOAA) as an area for future collaboration.

The JRC has started a scientific project to analyse the impact of space weather on global navigation satellite system (GNSS) receivers, which are used in a large number of critical networked infrastructures, such as fixed and wireless networks (including the internet), the power grid, and transport. In this context, the JRC has tested a broad range of commercial GNSS timing receivers to assess their resilience to various types of interference scenarios. This will be complemented by the installation of a JRC monitoring station in Peru to record the intensity of severe ionospheric scintillation in the GNSS bands. This will allow the creation of an empirical scintillation library used to test the robustness of commercial receivers.



Facts and figures

JRC Open Day, Ispra, 14 May 2011

- JRC's biggest ever event
- 10 292: record number of visitors
- 80 activities showcasing the JRC



Staff

The total number of staff at the JRC at the end of 2011 was 2 828:

Total Staff	M	F	Total
Core Staff			
Officials	1 229	531	1 760
Temporary agents	24	7	31
Visiting Staff			
Trainees	33	39	72
Postgraduate grantholders	35	38	73
Post-doctoral grantholders/ senior scientists	303	179	482
Contractual agents	165	199	364
Seconded national experts	35	11	46
Total	1 824	1 004	2 828

Of the 2 828 total, 74.76% worked on scientific projects, 23.29% carried out administrative or support activities and 1.95% worked in nuclear decommissioning and waste management. The total number of staff in the JRC in 2011 is comparable to that of 2010 (2 822).

Visiting staff

In addition to its core staff, the JRC proactively seeks to host researchers (grantholders), senior scientists, seconded national experts, and trainees, primarily from the Member States and Candidate Countries. Visiting staff bring advanced skills,

knowledge and expertise to help resolve current and future scientific challenges. In turn, they benefit from the cultural diversity, multidisciplinary research domains and state-of-the-art research facilities at the JRC.

Equal Opportunities

The gender balance of JRC staff in AD positions (managerial and administrative) is as follows:

AD positions	M	F
Senior management positions	91%	9%
Middle management positions	85%	15%
Non-management administrative positions	79%	21%

The Commission's Equal Opportunities Action Plan (EOAP) has set ambitious goals for the recruitment of women in the AD category. At the JRC, 20% of administrative AD positions are occupied by women, compared to the Commission average of 43%. Women currently occupy 21% of non-managerial AD positions and only 15% of middle management positions in the JRC. The goal of the EOAP is to increase these levels by 50% each, by recruiting more women for available official or temporary non-managerial and middle management AD positions. Recruiting women in 30% of senior managerial positions will also greatly improve the current 9% representation of women in this category.



Budget

The table below shows the breakdown of how the 2011 institutional budget was spent, in terms of available in commitment appropriations (EFTA credits are not included).

The credits available to the JRC are divided into staff expenses, means of execution (maintenance of buildings and equipment, electricity, insurance, consumables, etc.) and specific expenses (direct scientific procurements) relating to Framework Programme activities.

Outgoing expenses (in million Euro)	2011
Staff expenses	€ 246.07
Means of execution	€ 81.65
Operational appropriations (FP)	€ 40.77
Total (rounded up)	€ 368.49

In addition, €26.3 million was spent on the programme to decommission the JRC's nuclear installations, and to manage the waste activities related to the EURATOM Treaty. Additional credits of €22.37 million were received from the contributions of countries associated to the Framework Programme (FP).

JRC earned income

The following table shows the value of contracts signed in 2011. Income cashed amounted to €64 million. Some of the JRC's income comes from participating in FP7 collaborative projects ('Indirect Actions'), from performing additional work for Commission services, and from contract work carried out for third parties such as regional authorities or industry. These activities complement the tasks outlined in the JRC's Work Programme and are an essential tool for acquiring and transferring expertise and know-how.

Requests by Commission services for additional scientific and technical support accounted for more than half of earned income.

Contracts signed (in million Euro)	2011
Indirect Actions of the Framework Programme (FP)	€ 19.12
Support to Commission Services	€ 35.91
Third Party work	€ 10.99
Total (rounded up)	€ 66.02



Media

JRC media coverage in 2011

Number of press articles	2772
Number of very positive news items in top-tier media	108
Number of countries covered	68

Most reported topics

• Renewable energy	280
• Climate change issues	240
• Energy savings	140
• Nanomaterials	95
• Air quality and transport	90
• R&D Investments	80
• Maritime Affairs	80
• Global security and crisis management	76
• Space weather	67
• Reference materials	57



Publications

JRC Publications in 2011

Books and articles in peer reviewed journals	763
JRC Reference Reports	9
JRC Scientific and Technical Reports	347
Contributions published in conference proceedings	226
PhD theses	11

Total	1 356
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2011 guest editorials – JRC newsletter

Nikola Tororov – Minister of Education and Science, the Former Yugoslav Republic of Macedonia

Professor Patrick Cunningham – Chief Scientific Advisor to the Irish government

Professor Dr Zoltán Cséfalvay – Minister of State for National Economy, Hungary, President of the Competitiveness Council

Professor Maria Elżbieta Orłowska – Secretary of State, Poland

Maria Damanaki – European Commissioner for Maritime Affairs and Fisheries

William E. Kennard – Ambassador of the United States to the European Union

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Head of Division
Ministry for Science, Innovation and Higher Education
Bredgade 40
DK – 1260 Copenhagen K – Denmark

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Deputy Director General for European Affairs
Federal Ministry of Education and Research (BMBF)
DE – 53175 Bonn – Germany

Dr. Toivo RÄIM

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Ministry of Education and Research
EE – 15192 Tallinn – Estonia

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President of the Board of Directors of CETH
Director of the Chemical Process Engineering Research
Institute (CPERI-CERTH)
P.O. Box 361
57001 Thessaloniki
Greece

Prof. José Pío BELTRÁN

Laboratorio de Biología del Desarrollo Floral
Instituto de Biología Molecular y Celular de Plantas
(IB MCP – UPV – CSIC)
ES – 46022 Valencia – Spain

Mr. Christophe BEHAR

Directeur de la Direction de l'énergie nucléaire
CEA
FR – 91190 Gif-sur-Yvette – France

Dr. Paolo VENDITTI

Senior Counsellor of "Consiglio Nazionale delle Ricerche"
(CNR) and "Società di Gestione Impianti Nucleari" (SOGIN)
IT – 00184 Roma – Italy

Prof. Andrejs SILIŅŠ

Vice President
Latvian Academy of Sciences
LV – 1524 Riga – Latvia

Dr. Giedrius VILIŪNAS

Vice-Rector for Studies
Mykolas Romeris University
LT – 08303 Vilnius – Lithuania

Dr. Pierre DECKER

Conseiller de Gouvernement 1ère classe
Ministère de l'Enseignement supérieur et de la Recherche
LU – 2912 Luxembourg – Luxembourg

Waiting for nomination

Dr. Jennifer HARPER

Policy Unit Director
Malta Council for Science and Technology
MT – Kalkara CSP 12 – Malta

Dr. Jan NIEUWENHUIS

Directeur Innovatiestructuur
Ministerie van Economische Zaken
NL – 2500 EC Den Haag – The Netherlands

Dr. Daniel WESELKA

Bundesministerium für Wissenschaft und Forschung
Leiter d. Abteilung II/10
AT – 1010 Wien – Austria

Prof. Tadeusz LUTY

Institute for Physical and Theoretical Chemistry
Wroclaw University of Technology
PL – 50-370 Wroclaw – Poland

Prof. José CARVALHO SOARES

Centro de Física Nuclear da Universidade de Lisboa
PT – 1649-003 Lisboa – Portugal

ROMANIA ROMANIA	Prof. Ioan DUMITRACHE President Ministry of Education, Research and Innovation National University Research Council RO – 050025 Bucharest – Romania	FINLAND SUOMI/	Prof. Erkki KM LEPPÄVUORI Director General, VTT Technical Research Centre of Finland FI – 02044 VTT – Finland
SLOVAKIA SLOVENSKÁ REPUBLIKA/	Ms. Jaroslava KOVÁČOVÁ Science and Technology Division Ministry of Education, Science, Research & Development Stromová 1 SK-81330 Bratislava 1	SWEDEN SVERIGE/	Ms. Kerstin ELIASSEN former State Secretary for Higher Education and Research Stockbyvägen 15 S-182 78 Stocksund - Sweden
SLOVENIA SLOVENIJA/	Dr. Aleš MIHELIČ Director General of the Directorate for Technology Ministry of Higher Education, Science and Technology SI – 1000 Ljubljana – Slovenia	UNITED KINGDOM UNITED KINGDOM	Prof. Christopher SNOWDEN University of Surrey Guildford Surrey GU2 7XH U.K.

PARTICIPANTS

BOSNIA AND HERZEGOVINA BOSNA I HERCEGOVINA/	Mr. Ammar MIRAŠČIJA Head of Department for Science Ministry of Civil Affairs Trg Bosne i Hercegovine 3 BA – 71 000 Sarajevo – Bosnia and Herzegovina	NORWAY NORGE/	Dr. Kirsten BROCH MATHISEN Director The Research Council of Norway Division for Energy, Resources and the Environment P.O. Box 2700 St. Hanshaugen N-0131 Oslo
MONTENEGRO CRNA GORA/	Prof. Dr. Igor RADUSINOVIĆ Chairman of Montenegrin Council for Science and Research Ministry of Science Trg Vektre bb ME – 81 000 Podgorica – Montenegro	MACEDONIA FYROM/	Dr. Atanas KOCOV Dean of the Faculty of Mechanical Engineering MK – 1000 Skopje – Former Yugoslav Republic of Macedonia
CROATIA HRVATSKA/	Dr. Zdenko FRANIĆ Research scientist; Member of Croatian Parliament Institute for Medical Research and Occupational Health HR – 10 001 Zagreb – Croatia	ALBANIA SHQIPERIA/	Dr. Arjan XHELAJ Director, Academy – Telematic Network Albania Ministry of Education & Science Bld. "Dëshmorët e Kombit" UPT AL – 1001 Tirana – Albania
ICELAND ISLAND/	Mr. Hallgrímur JONASSON General Director Rannis Laugavegi 13 IS-101 Reykjavík - Iceland	SWITZERLAND SUISSE/	Mr. Bruno MOOR State Secretariat for Education and Research (SER) Head of the Multilateral Research Cooperation CH – 3003 Berne – Switzerland
ISRAEL	Dr. Shlomo WALD Chief Scientist Ministry of National Infrastructures IL – 91360 Jerusalem – Israel	SERBIA SRBIJA/	Dr. Viktor NEDOVIĆ Assistant Minister, Ministry of Science Department for Int'l Scientific & Technological Cooperation SR – 11000 Belgrade – Serbia
LIECHTENSTEIN	Mr. Karl-Heinz OEHR Amt für Volkswirtschaft LI – 9490 Vaduz – Liechtenstein	TURKEY TÜRKİYE/	Mr. Hüseyin GÜLER Head of Science, Technology, Innovation Policies and Strategies Unit Scientific and Technical Research Council (TÜBİTAK) TR – Kavaklıdere, 06100 Ankara – Turkey

Secretary of the Board of Governors:
Ms. Ulla ENGELMANN
European Commission JRC
SDME 10/53 - BE-1049 Brussels
Tel: +32 2 295 76 24 Fax: +32 2 2967483
e-mail: ulla.engelmann@ec.europa.eu

Assistant:
Ms. Iris BERGMANN-HÜBER
European Commission JRC
SDME 10/55, BE-1049 Brussels
Tel: +32 2 296 34 08 Fax: +32 2 2967483
e-mail: iris.bergmann@ec.europa.eu

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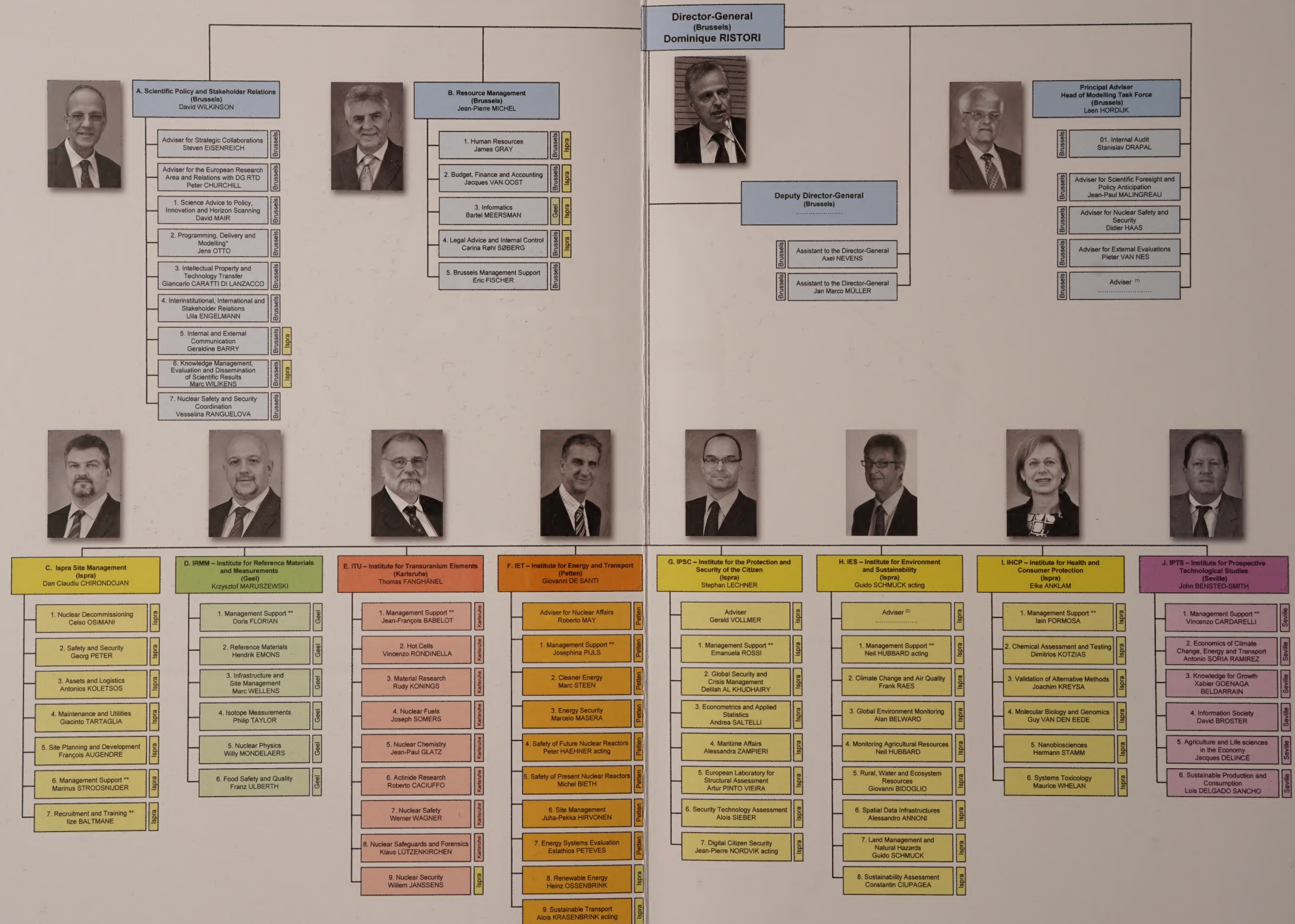
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Abstract

Report on the activities, accomplishments and resources related to the JRC's work carried out in 2011. An overview is given of the scientific achievements and activities.

JRC – JOINT RESEARCH CENTRE

ORGANISATIONAL CHART – December 2011



* At the initial phase, the Modelling Task Force will be managed by the Principal Adviser in Brussels
 ** Recruitment and Training (C.7) and Management Support Units have a functional reporting relation with the Director for Resource Management
 (1) Vesna VALANT, seconded to the Cabinet of Commissioner Potočnik
 (2) Peter PÄRT, seconded to the European Environment Agency

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